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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ms. Donna R. Searcy
Secretary
Federal Communications Commission
1919 M Street, N.W.
Room 222
Washington, DC 20554

Subject: Transmittal of Comments, CC Docket No. 92-297

As facilitator of the Mobile Satellite Service Above 1 GHz Negotiated Rulemaking Committee I am sending you the original and three copies of comments on the Notice of Proposed Rulemaking CC Docket No. 92-297. It is recognized that these are late comments, but it was necessary for the Negotiated Rulemaking Committee to complete its deliberations and to reach agreements before submitting its comments. The NRC submitted its report to the Chief, Common Carrier Bureau on April 19, 1993.

Edward F. Miller

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Facilitator, Mobile Satellite Service
Above 1 GHz Negotiated Rulemaking Committee

Enclosure

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Before the

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SUMMARY

The Mobile Satellite Service (MSS) Above 1 GHz Negotiated Rulemaking Committee (NRC), a Federal Advisory Committee, was established by the FCC to provide recommendations to the Commission concerning the implementation of the MSS and the radiodetermination satellite service (RDSS) at L-band (1610-1626.5 MHz) and S-band (2483.5-2500 MHz). The deliberations and technical analyses of the NRC, during the period of its existence (January 6 through April 6, 1993), are important to the rulemaking being considered under CC Docket No. 92-297. It is planned to use frequencies in the band 27.5-29.5 GHz for feederlinks from earth to space as an integral part of the low-earth orbit MSS systems proposed. The MSS Above 1 GHz NRC submits comments into this rulemaking procedure (1) to indicate planned use of frequencies in the band 27.5-29.5 GHz as feederlinks in the fixed satellite service (FSS), (2) to provide technical analyses that show interferences that result from the proposed frequency sharing between the local multipoint distribution service (LMDS) and the FSS used as feederlinks to MSS satellites, and (3) to indicate the adverse impact of the proposed rules on the more than 10 billion dollars of capital investment proposed for MSS.

The conclusion of the MSS NRC is that the LMDS should not be established in frequency bands that affect the MSS feederlinks.

These comments are provided at this time because of the need for the NRC to have completed its deliberations and to have reached agreements before submitting its comments.

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of

Rulemaking to Amend Part 1 and Part 21 of the Commission's Rules to Redesignate the 27.5 - 29.5 GHz Frequency Band and to Establish Rules and Policies for Local Multipoint Distribution Service	CC Docket No. 92-297 RM-7872; RM-7722

COMMENTS OF THE
MOBILE SATELLITE SERVICE ABOVE 1 GHz
NEGOTIATED RULEMAKING COMMITTEE

The Mobile Satellite Service Above 1 GHz Negotiated Rulemaking Committee ("NRC") hereby submits its comments in response to the Notice of Proposed Rulemaking, Order, Tentative Decision and Order on Reconsideration ("Notice") issued in the above-captioned proceeding.

I. INTRODUCTION

One of the telecommunications markets that is poised for tremendous economic development is the mobile satellite service (MSS). The feature of providing universal voice, data, and paging coverage via hand-held transceivers with satellite interconnections has great appeal to the public. The recent and continuing dynamic growth of cellular telephone service has developed a public appetite for telephone service anywhere, at any time. The mobile satellite service can provide that to rural areas, as well as urban areas. In fact, low earth orbit (LEO) satellite systems can provide these services and interconnections to any part of the world. Recent technology developments have made these MSS systems both technically and economically feasible. Applications before the FCC to provide these services represent a potential capital investment of more than 10 billion dollars. The success of United States Corporations in initiating these services and systems would provide technology to support America's economic growth, would provide U.S. leadership in critical world markets, and would generate high-skill, high-wage jobs for American workers.

To successfully implement these growing services, the MSS at L-band (1610-1626.5 MHz) and S-band (2483.5-2500 MHz) needs feederlink transmissions from earth to space from "gateway" stations. (Gateways provide interconnection into the public switched telephone network, control interconnections between

individual subscribers, and provide operations and maintenance of the network). Two MSS applicants plan to use Ka-band frequencies for these feederlinks from gateways to satellites. The specific frequencies that overlap with the proposed LMDS frequencies are shown in Figure 1 (Figure 4.4.2-1 from Annex 3 of the MSS NRC report). The inability to effectively share the Ka-band spectrum between the MSS feederlinks and the LMDS would inhibit the potential telecommunications, economic, and social benefits that would be gained from the successful introduction of the proposed mobile satellite service.

II. PLANNED USE OF 27.5-29.5 GHz AS FIXED SATELLITE SERVICE SUPPORT OF MSS FEEDERLINKS

The Iridium, low-earth orbit, mobile satellite service proposed by Motorola, Inc. plans to use 200 MHz of bandwidth between 27.5 and 29.5 GHz as feederlink frequencies. (See Figure 1.) These links are essential to network operations, since they control interconnections between individual subscribers and provide interconnections among gateways on a world-wide basis. Motorola has received an experimental license from the FCC, with satellite experiments to begin in 1995. Initial system operation by Motorola is planned in 1996, with full operations in 1998.

The technical and economic suitability of Ka-band for feederlinks to MSS systems is evidenced by TRW choosing 29.895-29.997 GHz for its feederlinks. Additionally, Celsat, a potential applicant for MSS at L and S bands has also chosen Ka-band for feederlinks (29.825-29.975 GHz).

The Ka-band frequencies near 30 GHz are technically suitable and are planned to be used by the mobile satellite service as feederlinks.

III. SHARING BETWEEN FSS FEEDERLINKS FOR THE MOBILE SATELLITE SERVICE AND THE LOCAL MULTIPOINT DISTRIBUTION SERVICE

The MSS NRC examined this question in detail. Informal Working Group 3 of the NRC identified the following potential interference paths of concern to the LEO MSS.

- From the LEO feeder transmitter to the LMDS subscriber receiver

- From LMDS to LEO satellite receiver

To evaluate these cases, the following analyses were developed (Section 4.4.2.1.2 from the MSS NRC Report, Annex 3 "Report of Working Group 3 to the MSS Above 1 GHz Negotiated Rulemaking Committee".

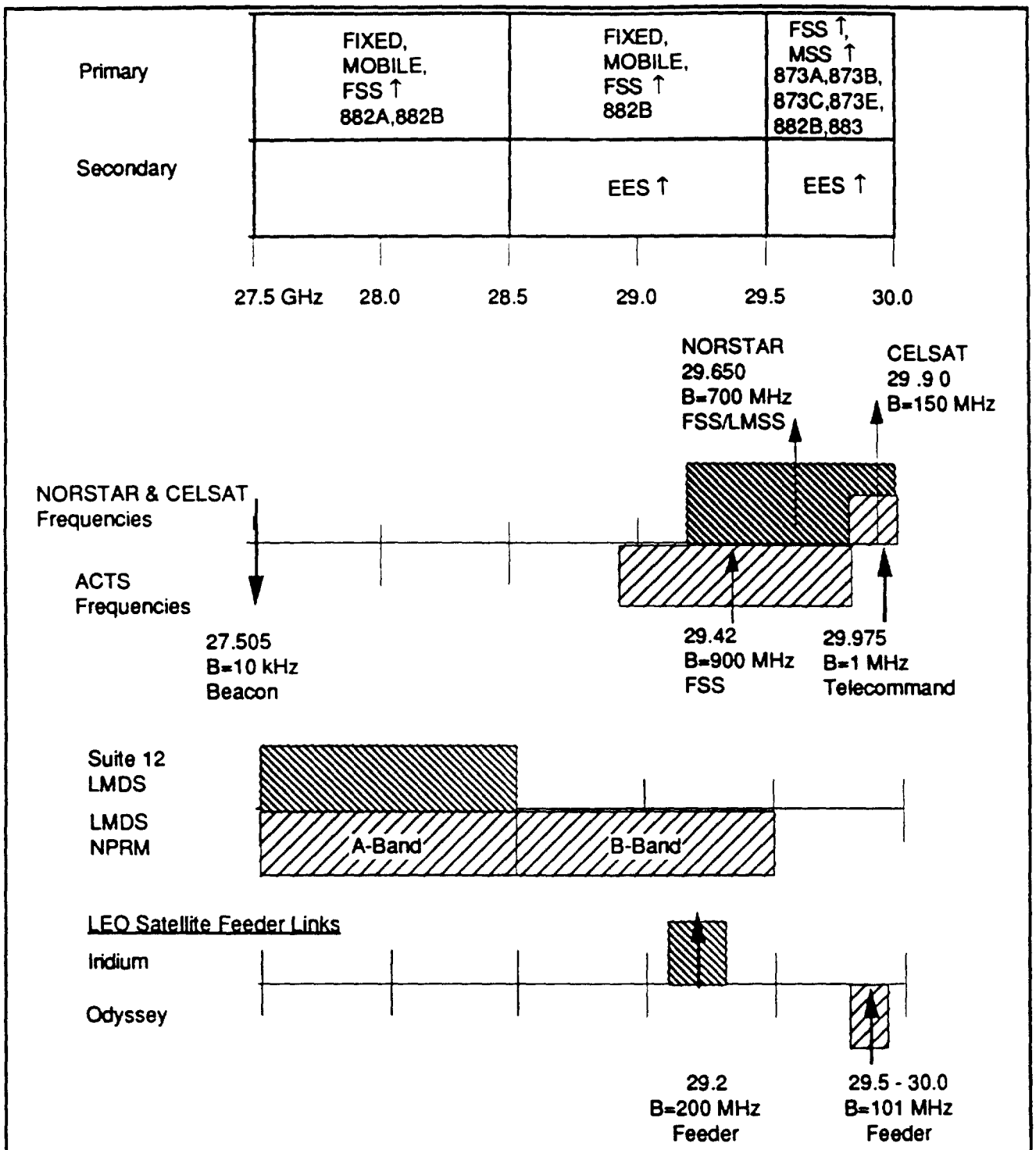

Figure 4.4.2-1. Region 2 allocations and other users of the 27.5-30.0 GHz band

Figure 1 of Comments

4.4.2.1.2 Sharing/Coordination with LMDS

In CC Docket No. 92-297, the FCC has issued an NPRM that proposes rules to establish the so-called Local Multipoint Distribution Service ("LMDS") in the frequency bands 27.5-29.5 GHz. The FCC's LMDS proposal (which includes a domestic U.S. reallocation of spectrum to the LMDS and associated service rules) would accommodate a cellular-like terrestrial system with groups of millimeter wave stations collecting broadcast FM video with small antennas mounted on user subscriber homes and businesses. The signals would be broadcast from hubs spaced 12 miles apart on a grid. They would operate in two separate bands of 1000 MHz (at 27.5-28.5 GHz and 28.5-29.5 GHz). Each 1000 MHz band would be divided into 50 channels of 20 MHz each, and the each 20 MHz channel would be further subdivided into an 18 MHz segment (for broadcast video) and a 2 MHz segment (available for two-way conversation and/or data between the user subscriber and the hub.

The anticipated LMDS baseline assumes that the two-way channels would consist of 30 kHz FM channels similar to analog cellular. Frequency reuse between cells would be achieved by alternating the hub's vertical and horizontal polarization for the video and broadcast channels. The forward narrow band link to each subscriber would be cross-polarized with the video transmissions.

The 2000 MHz of spectrum proposed for allocation to the LMDS are allocated on a co-primary basis in the United States to the Fixed Service and the Fixed-Satellite Service. The FSS allocation also covers the contiguous 29.5-30 GHz band (on a shared co-primary basis in the U.S. with the Mobile-Satellite Service). The 2500 MHz allocation to FSS at 27.5-30.0 GHz (Earth-to-space) is paired with the 2500 GHz allocation at 17.7-20.2 GHz for space-to-Earth transmissions.

Although the FCC correctly noted in its LMDS NPRM that the 27.5-29.5 GHz band is not presently used for FSS transmissions, the allocation's current fallowness is fully consistent with what was envisioned when the spectrum was initially allocated to the FSS by the ITU. The Ka-Band FSS allocations were intended essentially as an expansion band for future FSS services.

Ironically, the FCC's LMDS proposal was thrust upon the scene just as the contemplated FSS services are now beginning to materialize in increasing numbers. This Working Group believes that FSS access to the full 2000 MHz at 27.5-29.5 GHz is already necessary to satisfy this increasing demand from commercial satellite operators.

In this regard, NASA will begin the commercialization of the Ka-Band in a matter of months with the launch of the Advanced Communications Technology Satellite ("ACTS"); Norris Satellite Communications, Inc., which was authorized last year to build an FSS satellite to operate at 29.5-30 GHz for uplinks, recently applied to extend its uplink authorization to include the 29.3-29.5 GHz band; and two of the MSS/RDSS applicants -- Motorola and TRW --currently propose to use 200 MHz and approximately 100 MHz respectively of the Ka-Band FSS allocation at 27.5-30 GHz for feeder links. In addition, countries around the world are developing Ka-Band satellite systems that would use the frequencies proposed for LMDS for FSS services.

As shown below with regard to the IRIDIUM feeder links at 29.1-29.3 GHz, and as independently concluded by NASA (in its comments to the FCC in CC Docket No. 92-297) for the Ka-Band FSS service in general, FSS systems and LMDS systems are unlikely to be able to operate compatibly in the same bandwidth. Because LMDS systems would operate across the entire 27.5-29.5 GHz band, and

4.4.2.1.2.1 Interference from LMDS to Iridium LEO satellite receivers

The IRIDIUM LEO satellite has a receiver noise floor of -197 dBW/Hz on the feeder uplink. The Suite 12 hub antennas have low gain (10 dB) in the vertical plane suggesting a half power beamwidth of about 60 degree or 30 degree above the horizontal plane. Therefore, the maximum probability for interference from a collection of LMDS stations is when the satellite is moderately low on the horizon and a feeder Gateway station is located near the metropolitan area containing the LMDS hub stations. In this scenario, the hubs omni antennas couple tightly with the satellite uplink beam with an average gain of at least 7 dB. With the hubs planned for 12 mile grids then each hub would cover 113 square miles of territory. An IRIDIUM spot beam would cover about 2800 square miles and therefore be subjected to uplink interference power from 25 hubs at a time whenever a Gateway station is located in the same metropolitan area.

Table 4.4.2.1.2-1 is a calculation of the uplink interference power into an IRIDIUM satellite receiver. As can be seen the Suite 12 network of hub stations, would add a measurable amount of interference noise into a LEO satellite co-sharing this frequency band even using nominal link parameters.

TABLE 4.4.2.1.2-1 UPLINK INTERFERENCE POWER INTO IRIDIUM SATELLITE

Hub Xmtr Power/channel	-5	dBW
Min. Antenna Gain	7	dB
EIRP	2	dBW
Power Bandwidth (18 MHz)	-72.5	dB/Hz
Transmitted Spectral Density/Hub	-70.5	dBW/Hz
Factor for 25 interfering hubs	14	dB
Composite uplink power dBW/Hz		-66.5
Average path loss	189	dB
Average Satellite Ant Gain	28	dB
Total Uplink Interference Power		
Into Satellite	-213	dBW/Hz
Satellite Noise Floor	-197.5	dBW/Hz
Percent added noise to receiver	3%	

4.4.2.1.2.2 Interference from Iridium LEO feeder earth stations to LMDS

Each IRIDIUM Gateway station has low sidelobe 3 meter dishes with power programming of the uplink to mitigate possibility of outages due to high density rain cells between a station and its LEO satellite. Typically the antennas will be mounted on a low building within a radome which places them around 50 feet above the ground close to the elevation of 70 feet planned for the LMDS hub stations. Under these circumstances it is necessary to examine Line of Sight (LOS) radio paths to determine the degree of interference injected into Suite 12 receive terminals using Mode 1 troposphere propagation distances.

Table 4.4.2.1.2.2-1 examines the LOS interference injected into a Suite 12 two-way link. The forward and reverse link budgets are listed in the first two columns. As can be seen, for

In Table 4.4.2.1.2.2-2 the possibility of interference into the users video receiver. The Gateway must intercept the narrow user beam to affect the received C/N. However, this link is more susceptible because of its larger noise bandwidth and higher gain antenna. However, it is less likely to encounter a beam to beam coupling due to the narrowness of both beams, but when such an encounter occurs there could be a complete outage of the users video channel for up to 10 seconds (i.e. tracking slew rates are 10 seconds per degree).

4.4.2.1.2.3 Allocation Co-existence

As a consequence of the interfering situations described above it is recommended that the best way for the IRIDIUM earth stations to co-exist with the proposed LMDS is to exclude LMDS from the 200 MHz portion of the FSS allocation (29.1 - 29.3 GHz).

Table 4.4.2.1.2.2-1

Interference Into Suite 12 LMDS Two Way

Two-way Links for Los Angeles	Hub-User Forward	User-Hub Reverse	7.5 dish Gateway Uplink into Cell Hub Clear	Rain
Freq	28.0	28.0	29.4	29.4
Xmtr Pwr (dBW/3 MHz)			-11.8	13.0
Xmtr Pwr (dBm/30 kHz)	-2.0	-2.0	-1.8	23.0
Ant feed Loss (dB)	1.0	1.0	1.0	1.0
Xmtr Ant Gain (dBi)	10.0	32.0	5.1	5.1
EIRP (dBm)	9.0	31.0	4.3	29.1
Path Length (miles)	4.5	4.5	20.0	20.0
Space loss @ 28 GHz (dB)	138.6	138.6	152.0	152.0
Recvr Ant Gain (dBi)	32.0	10.0	10.0	10.0
Received Carrier Power (dBm)	-97.6	-97.6	-137.6	-112.8
k(dBm/K/Hz)	-198.6	-198.6	-198.6	-198.6
Bandwidth: 30 kHz (dB-Hz)	44.8	44.8	44.8	44.8
Receiver Temp (dB-K)	29.5	29.5	29.5	29.5
Receiver Noise Pwr (dBm)	-124.3	-124.3	-124.3	-124.3
		-124.1	-112.5	
C/N (dB)	26.7	26.7	26.5	14.9
Min. C/N Reqd	13.0	13.0	13.0	13.0
Rain Margin (dB)	13.7	13.7	13.5	1.9

Table 4.4.2.1.2.2-2

Interference Into Suite 12 LMDS Two Way Link

Video Link for Los Angeles — 7.5 in dish

	Hub-User	Gateway Uplink into User Terminal		
		Clear	Rain	
Freq	28.0	29.4	29.4	
Xmtr Pwr/Channel (dBW/3MHz)	-11.8	-11.8	13.0	
Ant feed Loss (dB)	1.0	-1.0	-1.0	
Xmtr Ant Gain (dBi)	10.0	5.1	5.1	gain 9°
EIRP (dBW)	-0.8	-7.7	17.1	
Path Length (miles)	4.5	20.0	20.0	
Space loss @ 28 GHz (dB)	138.6	152.0	152.0	
Recvr Ant Gain (dBi)	32.0	32.0	32.0	
Recved Power (dBW)	-107.4	-127.6	-102.8	
k (dBW/K/Hz)	-228.6	-228.6	-228.6	
Bandwidth: 18 MHz (dB-Hz)	72.6	72.6	72.6	
Receiver Temp (dB-K)	29.5	29.5	29.5	6 dB NF
Receiver Noise Pwr (dBW)	-126.5	-126.5	-126.5	
IM+Noise (dBW)	-125.9	-123.7	-102.8	N+1
C/N	18.5	16.3	5.2	
Min C/N Reqd	13.0	13.0	13.0	
Rain Margin (dB)	5.5	3.3	-7.8	

After evaluating the foregoing analyses and conclusions, the MSS NRC provided the following recommendations to the FCC. (p. 49, "Report of the MSS Above 1 GHz Negotiated Rulemaking Committee."

> "The Committee evaluated the FCC's pending rule-making proposal to establish the Local Multipoint Distribution Service ("LMDS") -- a cellular-like terrestrial service that would broadcast FM video and other signals between hubs spaced 12 miles apart on a grid and subscriber homes and business -- in the frequency bands 27.5-29.5 GHz. The Committee concluded that FSS systems and LMDS systems are unlikely to be able to operate compatibly in the same band, and that the establishment of the LMDS service would preempt the co-primary FSS service in 2000 MHz of the 2500 MHz allocation at 27.5-30.0 GHz, and also in 2000 MHz of the corresponding FSS downlink allocation at 17.7-20.2 GHz.
>
> In light of the apparent inability of LMDS to share frequency bands with FSS systems (some of which are soon to be launched), and the substantial threat the proposal poses to the future of the FSS in the 20/30 GHz band, the Committee recommends that the FCC, if it is to establish the LMDS, do so in frequency bands that are not currently allocated to the FSS. The Committee notes that LMDS interests were not represented on the Committee.
>
> As a consequence of the interfering situations described above it is recommended that the best way for the Iridium earth stations to coexist with the proposed LMDS is to exclude LMDS from 29.1-29.3 GHz (200 MHz) in the FSS allocation 28.5-29.5 GHz."

IV. IMPACT OF LMDS OPERATION IN THE BAND 27.5-29.5 GHz

LMDS and the MSS feederlinks cannot share the same frequencies, as indicated by the analyses in the previous section. If LMDS were to operate at frequencies planned for MSS feederlinks, the MSS systems would have to seek other frequencies and would be subject to redesign.

Moving to other frequencies near 30 GHz (29.5-30.0 GHz, for example) generates interference/sharing problems with MSS feederlinks planned for those frequencies and with geostationary FSS systems that would operate at those same frequencies. The use of 2.0 GHz by LMDS in the frequency range 27.5-29.5 GHz would crowd the FSS users of all types into only 500 MHz. The sharing of frequencies between feederlinks to LEO MSS systems and

geostationary FSS satellites is particularly difficult because of the changing geometric relations between the satellites. Movement of all MSS feederlinks and other FSS uses into 29.5-30.0 GHz does not appear to be practicable.

Attempting to obtain other frequencies for MSS feederlink use would delay implementation because of the need to redesign systems to operate at other frequencies and because of attendant delays in the regulatory process. The Motorola system "Iridium" was recently reported to have an investment cost of 7 billion dollars. That system would be delayed, as would the other proposed MSS systems (all systems totalling over 10 billion dollars in investment cost). Those delayed investments would have economic impact in delayed job creation. And of course, the any time, any place telecommunications services would not be available as soon.

V. CONCLUSION

Wherefore, on consideration of the foregoing, the Mobile Satellite Service Above 1 GHz Negotiated Rulemaking Committee urges the Commission, if it is to establish the LMDS, do so in frequency bands that are not currently allocated to the FSS. Furthermore, if it is the conclusion of the Commission that overwhelming public interest considerations and other factors justify the establishment of the LMDS in the band near 30 GHz, the MSS NRC urges the Commission to exclude LMDS from 29.1-29.3 GHz (200 MHz) in the FSS allocation 28.5-29.5 GHz.